



MNS Microwave Chip Capacitors



Features

- Excellent Repeatability (Wafer-to-Wafer and Lot-to-Lot)
- Small Size
- Low Loss, High Q
- Available with Round or Square Bonding Pads

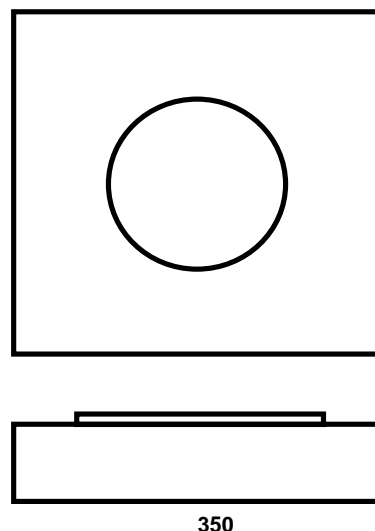
Description

M/A-COM's MA4M series of MNS (metal-nitride-silicon) silicon chip capacitors is designed specifically for high reliability and repeatable performance in microwave circuit applications. These capacitors are made using a low pressure chemical vapor deposition (LPCVD) that results in dense, uniform nitride layers. These capacitors exhibit higher capacitance per unit area (resulting in smaller chip size) than similar MOS, MIS and ceramic capacitors. Evaporated gold contacts are used to provide an easily bondable metal pad on the capacitor chip. M/A-COM MNS capacitors have shown no measurable capacitance change when subjected to the rated standoff voltage of 150°C.

The MA4M series of chip capacitors is an excellent choice for use in hybrid microwave circuits up through Ku-band, where low loss, high reliability, small size and temperature stability are prime concerns.

These chip capacitors are suited for applications requiring DC blocks, coupling capacitors, bypass capacitors, capacitive loads and tuning elements in oscillators, multipliers and filters.

Case Style



Comparison of M/A-COM MNS Capacitors to Ceramic Chip Capacitors

Characteristics Compared	MNS	Ceramic
Operating Temperature Range	-55 to +200°C	-55 to +125°C
Temperature Coefficient	180 PPM	1000 PPM
Insertion Loss of a 20 pF Capacitor in a 50 Ω line at 15 GHz	0.1 dB	0.2 dB
Chip Size		
200 pF, 100V	40 x 40 mils	70 x 70 mils
20 pF, 100V	22 x 22 mils	50 x 50 mils

Specifications

Chip Capacitors with Round Bonding Pads				
Model Number	Capacitance (pF) ^{1,2,3,4} ± 10 %	Maximum Standoff Voltage Rating ^{2,5} (Volts)	Chip Style	Nominal Top Contact Diameter (mils)
MA4M2002	2	200	132	3.5
MA4M2005	5	200	132	6.0
MA4M1010	10	100	132	6.0
MA4M1020	20	100	132	9.0
MA4M2020	20	200	132	11.5
MA4M1030	30	100	132	11.0
MA4M1050	50	100	132	14.0
MA4M1080	80	100	199	18.0
MA4M1100	100	100	199	20.0
MA4M2100	100	200	200	26.0
MA4M1200	200	100	200	28.0
MA4M1250	250	100	200	32.0
MA4M1300	300	100	201	35.0
MA4M2300	300	200	263	45.0
MA4M1600	600	100	263	48.0

Chip Capacitors with Square Bonding Pads			
Model Number	Capacitance (pF) ^{1,2,3,4} ± 10 %	Maximum Standoff Voltage Rating ^{2,5} (Volts)	Chip Style
MA4M3010	10	200	350
MA4M3020	20	200	351
MA4M3030	30	200	352
MA4M3050	50	200	354
MA4M3100	100	50	358
MA4M3150	150	50	359

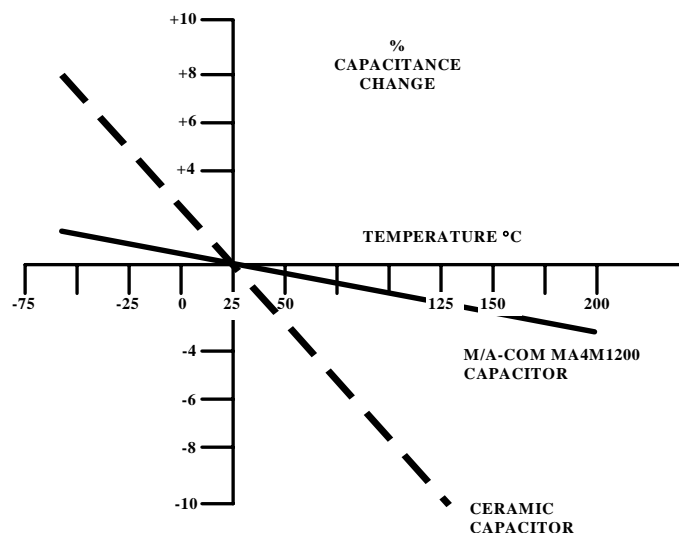
Notes:

- 1 5% capacitance tolerance is available on request.
- 2 Other capacitance and standoff voltage values are available on request.
- 3 Capacitance is measured at 1 MHz.
- 4 Temperature coefficient of capacitance is nominally 180 PPM/°C.
- 5 Device failure may occur if standoff voltage ratio is exceeded.

Maximum Ratings

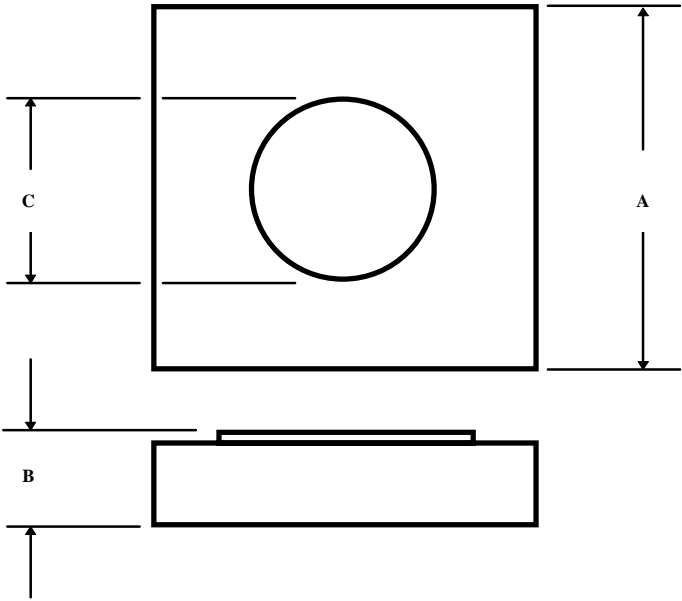
Applied Voltage	Specified standoff voltage
Operating Temperature	-55°C to +200°C
Storage Temperature	-55°C to +200°C

TYPICAL CAPACITANCE CHANGE FOR MNS and CERAMIC CAPACITOR vs TEMPERATURE (200 pF CAPACITOR)



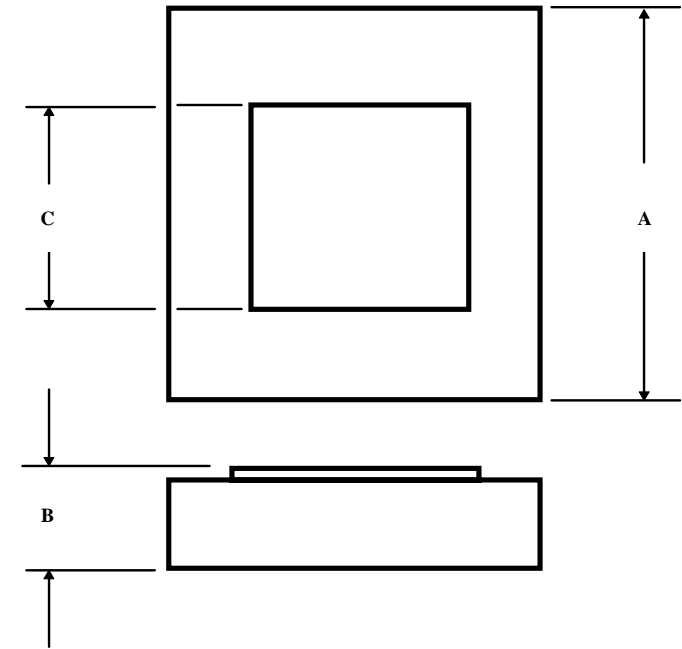
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Case Style



Chip Style	DIM.	INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
132	A	0.020	0.024	0.51	0.61
	B	0.003	0.008	0.08	0.203
199	A	0.027	0.031	0.69	0.79
	B	0.004	0.008	0.10	0.203
200	A	0.037	0.041	0.94	1.04
	B	0.004	0.008	0.10	0.203
201	A	0.047	0.051	1.19	1.30
	B	0.004	0.008	0.10	0.203
263	A	—	0.060	—	1.52
	B	0.004	0.008	0.10	0.203

Note:
For "C" dimension on above case styles, see specifications.



Chip Style	DIM.	INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
350	A	0.018	0.021	0.46	0.53
	B	—	0.008	—	0.203
	C	—	0.009	—	0.23
351	A	0.018	0.021	0.46	0.53
	B	—	0.008	—	0.203
	C	—	0.012	—	0.30
352	A	0.018	0.021	0.46	0.53
	B	—	0.008	—	0.203
	C	—	0.015	—	0.38
354	A	0.020	0.023	0.51	0.58
	B	—	0.008	—	0.203
	C	—	0.018	—	0.46
358	A	0.018	0.021	0.46	0.53
	B	—	0.008	—	0.203
	C	—	0.013	—	0.33
359	A	0.018	0.021	0.46	0.53
	B	—	0.008	—	0.203
	C	—	0.016	—	0.41

Bonding and Handling Considerations for MNS Chip Capacitors

Handling

Normal precautions that are common to the handling of hybrid semiconductors also apply to MNS chip capacitors. Removal of chips from waffle packs and subsequent handling should be done with a vacuum pencil. Pencils equipped with either metallic or nonmetallic tips are acceptable.

Surface Preparation

Each MNS chip and substrate should be free of oils and other surface contamination. Such contaminants may result in poor solder wetting. Cleansing can be done with acetone, alcohol, freon, TMS or other common microelectronic solvents. Burnishing of MNS capacitor chips is not necessary or recommended.

Solder

Soldering temperatures up to 300°C are acceptable for a duration not greater than 5 seconds for MNS chip capacitors. Any of the common tin-lead-silver, lead-indium, or higher temperature gold alloy solders are acceptable provided that the 300°C temperature is not exceeded. Pure tin or tin-antimony solders are not recommended. Cleaning of residual flux is required and can be accomplished with a fluorinated or chlorinated solvent.

Conductive Epoxy

Any of the conductive epoxies that are available for semiconductor die attachment are acceptable for MNS chip capacitor attachment. Follow the manufacturer's recommendations for mixing and application carefully. Take care to seat the capacitor on the substrate using a soft implement.

Lead Bonding

Ball, ultrasonic, TC or pulse bonding of the wire or ribbon leads are all acceptable methods. Temperature for the pulse bonder should not exceed 300°C. Maximum pressure applied to the MNS capacitor chips should not exceed 25 grams for any of the methods used. Proper procedure will result in bond strength that exceeds MIL-STD-883B Method 2011.2 for gold wire or gold ribbon.